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# New species of *Cephalotrichum*, *Leptographium*, and *Myrothecium* from soil in China

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Abstract—Three new species isolated from soil in China—*Cephalotrichum turriforme*, *Leptographium lateritium*, and *Myrothecium curvisporum*—are described, illustrated, and compared morphologically with similar species. The type specimens (dried cultures) and living cultures are deposited in the Herbarium of Shandong Agricultural University: Plant Pathology (HSAUP).

Key words—asexual fungi, dematiaceous hyphomycetes, taxonomy

## Introduction

*Cephalotrichum* was established by Link (1809) with *C. stemonitis* as type species. This genus produces its spores in a dry head at the apex of a complex erect conidiophore or synnema, which is often up to a millimeter in height. The synnemata produce chains of powdery conidia with a 'bottle brush' or 'feather' appearance. The ovoid conidia are produced from penicillately arranged, annellidic conidiogenous cells covering the sporogenous area (Chlebicki 2008).

*Leptographium*, established by Lagerberg & Melin (Lagerberg et al. 1927) with *L. lundbergii* Lagerb. & Melin as type species, is characterized by dark, macronematous, mononematous, penicillately-branched conidiophores that

§ Y.L. Jiang and Y.M. Wu contributed equally to this work.

produce annellidically (or both annellidically and sympodially) proliferating conidiogenous cells with hyaline, aseptate conidia produced in a slimy matrix (Hughes 1953; Kendrick, 1961, 1962, 1980; Wingfield 1985).

*Myrothecium*, founded by Tode (1790) and sanctioned (in an emended form) by Fries (1829), was typified by *M. inundatum* Tode. Historically, the genus has been characterized by sporodochia that are shallow cups covered with a viscid spore-mass at first green, becoming jet black, with a white margin of flocculent contorted hyphae, with or without setae; conidiophores that are septate, hyaline or olivaceous, consisting of a main axis which is once or twice branched, with the branches apical and arranged penicillately; phialides that are narrowly clavate, hyaline or pale olive green; and conidia that are small, cylindrical, or elliptical with a truncate base, often guttulate, continuous, subhyaline or pale olive green, abstricted singly to form a black viscid mass (Ellis 1971, Tulloch 1972). However, as outlined by Schroers et al. (1999) and Seifert et al. (2011), a distinction is now made between *Myrothecium* sensu stricto (of uncertain family affinity, and without authenticated teleomorphs) and "*Myrothecium*-like" anamorphs (with teleomorph connections in *Nectriaceae* and *Bionectriaceae*).

During a survey on soil dematiaceous hyphomycetes in China, we obtained three fungi that grew on potato dextrose agar (PDA) and exhibited the morphological characters typical of *Cephalotrichum*, *Leptographium*, and *Myrothecium*. They did not match with any congeneric species and are therefore proposed as new taxa.

***Cephalotrichum turriforme*** T.Y. Zhang, Y.L. Jiang & Y.M. Wu, **sp. nov.** Fig. 1

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Differs from *Cephalotrichum microsporum* by its larger conidia, from *C. ovoideum* by its unbranched synnemata with tower-shaped heads, and from *C. stemonitis* by its shorter annellophores and narrower conidia.

Type: China, Hubei Province, Fangxian County, from a farmland soil, 15 October 2004, Y.L. Jiang (**Holotype**, HSAUP $II_{05}$0539).

Etymology: in reference to the tower-shaped heads of the synnemata.

Colonies on PDA effuse, blackish brown. Mycelium partly superficial, partly immersed; hyphae hyaline, branched, septate, smooth, 1–3.5 µm diam. Synnemata 500–800 µm high, unbranched, with sharp turriform heads. Annellophores ampuliform, brown, penicillately arranged, 8–11 µm long, with swollen base 2–3.5 µm diam., narrowing abruptly into the annellated region 1.5–2 µm diam. Conidia solitary or catenate, ovoid to broadly ovoid, aseptate, smooth, truncate at the base and pointed at the apex, 5–8 × 3.5–4 µm, brown, dark brown to black in mass.

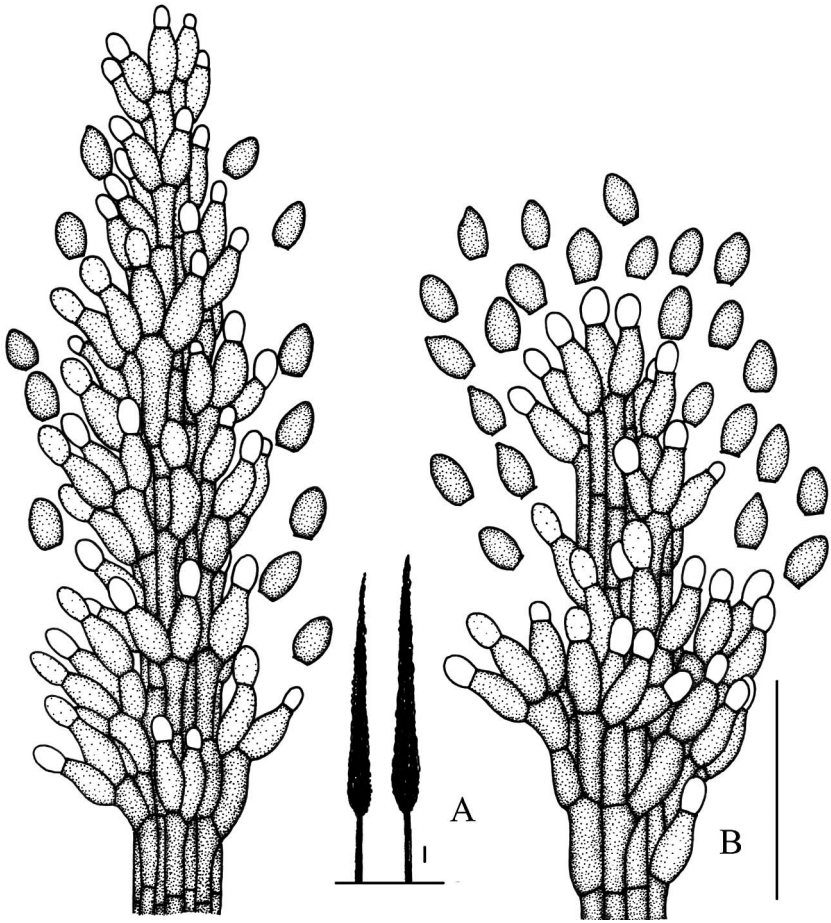


Fig. 1. *Cephalotrichum turriforme* (ex holotype HSAUP $II_{05}$0539).
Conidia, synnemata, conidiophores, and annellophores. Scale bars: A = 100 μm, B = 25 μm.

Comments: In conidial morphology, *Cephalotrichum turriforme* is close to *C. microsporum* (Sacc.) P.M. Kirk, *C. ovoideum* Y.L. Jiang & T.Y. Zhang, and *C. stemonitis* (Pers.) Nees; however, *C. microsporum* differs by its much smaller conidia (3–5 × 2–3 μm) with rounded or pointed apices (Kirk & Spooner 1984); *C. ovoideum* differs by its branched synnemata with spherical or subspherical heads and pale yellowish brown to yellowish brown conidia (Jiang et al. 2011); and *C. stemonitis* differs by its longer annellophores (8–25 μm) and bigger conidia (6–8.5 × 4–4.5 μm; Morton & Smith 1963).

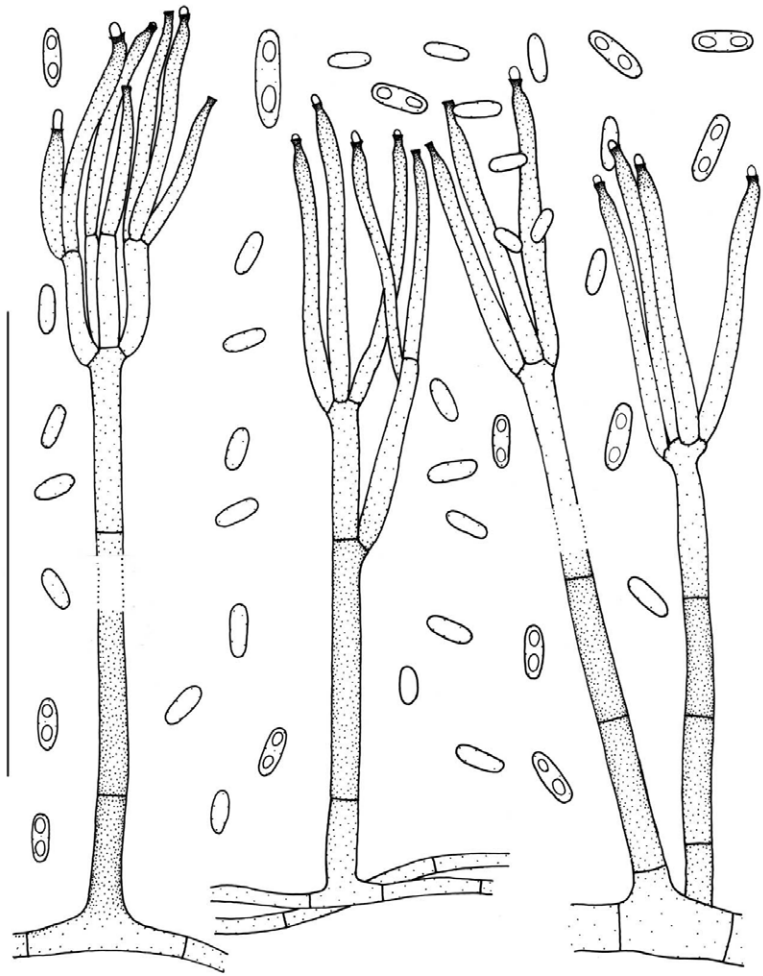

Fig. 2. *Leptographium lateritium* (ex holotype HSAUP $II_{04}2816$).
Conidia, conidiophores, conidiogenous apparatus, and annellation. Scale bar = 50 μm.

***Leptographium lateritium*** J.J. Xu & T.Y. Zhang, **sp. nov.** Fig. 2

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Differs from *Leptographium terebrantis* by its brick red or reddish brown colored colonies and smaller conidia with rounded ends.

Type: China, Fujian Province, Longyan City, from a park soil, 12 September 2004, J.J. Xu (**Holotype**, HSAUP $II_{04}2816$).

Etymology: in reference to the brick-red colony.

Colonies on PDA effuse, velvety or cottony, loose, brick-red or reddish brown, reverse the same in color, growing moderately fast, reaching 5–8 cm diam. in 2 weeks at 25 °C. Mycelium mostly superficial; hyphae sometimes aggregate forming ropes, pale to mid brown, branched, septate, smooth, 2–9 µm wide. Conidiophores arise on aerial hyphae or mycelial ropes, lateral, single or sometimes in groups, macronematous, mononematous, septate, stipe erect or suberect, pale brown to brown, becoming lighter in color at the apex, ≤325 µm long, 2.5–3.5 µm diam. and slightly swollen at the apex; conidiogenous apparatus consisting of no more than two series of branches, primary branches 2–5 on stipe, 10–30 × 2–3 µm, secondary branches 9–32 × 2–3 µm. Conidiogenous cells discrete, arranged penicillately, cylindrical, subhyaline to pale brown, smooth, tapering from base to apex, annellidic region dark brown to blackish brown, 9–35 × 2–3 µm. Conidia accumulating in slimy heads, ellipsoidal, cylindrical to oblong, hyaline to pale brown, smooth, aseptate, rounded at both ends, sometimes 1–2-guttulate, 3–10 × 1.5–2 µm.

Comments: In conidial morphology, *Leptographium lateritium* resembles *L. terebrantis* S.J. Barras & T.J. Perry, which differs by its olivaceous black, yellowish olive, dark green olive to olive colonies, and its bigger conidia (2.4–12.8 × 1.2–3.7 µm; x = 7.4 × 2.5 µm, and a length often increasing up to 25–30 µm) with truncate ends (Barras & Perry 1971).

***Myrothecium curvisporum*** Y.L. Zhang & T.Y. Zhang, **sp. nov.** Fig. 3

MycoBank MB 818980

Differs from all other *Myrothecium* species by its lunate conidia.

Type: China, Hainan Province, Mt. Wuzhishan, from a montane soil, 16 November 2005, Y.L. Zhang (**Holotype**, HSAUP $II_{05}2312$).

Etymology: in reference to the sharply curved conidia.

Colonies on PDA effuse, loosely flocculent, white, reverse pale brown or greyish white, growing rapidly attaining a diameter of 5 to 7 cm in 2 weeks at 25 °C. Sporodochia stalked, no more than 1 mm diam., often confluent within larger masses; green at first, later becoming black with white floccose margin. Mycelium superficial and immersed; hyphae hyaline, smooth, branched, septate, 2–3 µm wide. Conidiophores hyaline to pale brown, smooth, with apical branches arranged penicillately. Phialides slenderly subulate, 30–50 × 0.5–1.3 µm. Conidia aseptate, often curved, lunate, generally biguttulate, 4–6 × 1.5–2 µm, accumulating in dark green to black, viscid mass.

Comments: Under the label "*Myrothecium* state of *Nectria bactridioides* Berk. & Broome", Ellis (1971) and Tulloch (1972) described an anamorph on *Theobroma*

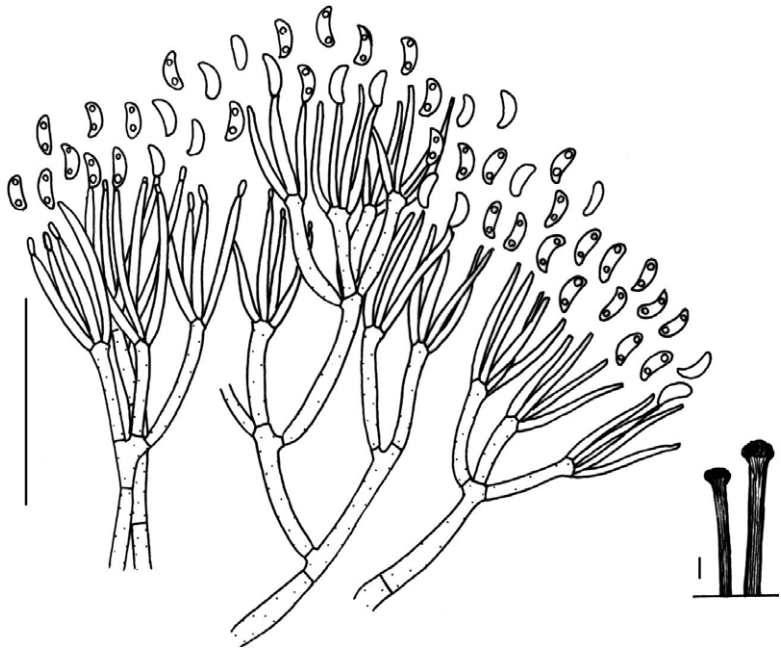

Fig. 3. *Myrothecium curvisporum* (ex holotype HSAUP $II_{05}2312$).
Conidia, sporodochia, conidiophores, and phialides. Scale bars = 25 μm.

in Sri Lanka. However, Samuels (1988) described *Nectria bactridioides* [≡ *Nectriopsis bactrydioides* (Berk. & Broome) Samuels] as a mycoparasite with no known anamorph, and identified one of its substrates as the anamorphic state of the lignicolous species *Nectria pityrodes* (Mont.) Mont. [≡ *Bionectria pityrodes* (Mont.) Schroers]. This anamorph was described as "*Myrothecium*-like" (Schroers et al. 1999), and subsequently named as *Clonostachys pityrodes* Schroers, which differs from *M. curvisporum* [and also from the "*Myrothecium* state of *Nectria bactridioides*"] by its non-stipitate, flat to cupulate sporodochia and its larger, symmetrical, oval conidia (5.8–7.2 × 2.8–3.4 μm; Schroers 2001). The "*Myrothecium* state of *Nectria bactridioides* has stipitate or synnematous sporodochia and smaller, asymmetrical, ellipsoid or allantoid conidia with rounded ends (Ellis 1971, Tulloch 1972); these sporodochial characters and the conidial size are similar to those of *M. curvispora*, which differs by most of its conidia being lunate, with acute ends and a greater degree of curvature. We conclude that *M. curvisporum* differs from all described *Myrothecium*-like species, both named and unnamed.

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**Literature cited**

Barras SJ, Perry T. 1971. *Leptographium terebrantis* sp. nov. associated with *Dendroctonus terebrans* in loblolly pine. Mycopathologia et Mycologia Applicata 43(1): 1–10. https://doi.org/10.1007/BF02051496

Chlebicki A. 2008. *Cephalotrichum stemonitis* as a biofilm inhabitant in the gold mine in Poland. Acta Mycologica 43(1): 67–70. https://doi.org/10.5586/am.2008.008

Ellis MB. 1971. Dematiaceous hyphomycetes. Commonwealth Mycological Institute, Kew, Surrey, England. 608 p.

Fries EM. 1829. IX. *Myrothecium* Tode ex em. Systema Mycologicum 3(1): 216–218.

Hughes SJ. 1953. Conidiophores, conidia, and classification. Canadian Journal of Botany 31: 577–659. https://doi.org/10.1139/b53-046

Jiang YL, Xu JJ, Wu YM, Zhang YL, Liu HM, Pan HQ, Zhang TY. 2011. Studies on *Cephalotrichum* from soils in China—twelve new species and two new combinations. Mycotaxon 117: 207–225. https://doi.org/10.5248/117.207

Kendrick WB. 1961. The *Leptographium* complex. *Phialocephala* gen. nov. Canadian Journal of Botany 39: 1079–1085. https://doi.org/10.1139/b61-094

Kendrick WB. 1962. The *Leptographium* complex. *Verticicladiella* Hughes. Canadian Journal of Botany 40: 771–797. https://doi.org/10.1139/b62-072

Kendrick WB. 1980. The generic concept in hyphomycetes — a reappraisal. Mycotaxon 11: 339–364.

Kirk PM, Spooner BM. 1984. An account of the fungi of Arran, Gigha and Kintyre. Kew Bulletin 38(4): 503–597. https://doi.org/10.2307/4108573

Lagerberg T, Lundberg G, Melin E. 1927. Biological and practical researches into Blueing in Pine and Spruce. Svenska Skogsvårdsföreningens Tidskrift 2(2–4): 145–272.

Link HF. 1809. Observationes in ordines plantarum naturales. Dissertatio I. Magazin der Gesellschaft Naturforschender Freunde zu Berlin 3(1): 3–42.

Morton FJ, Smith G. 1963. The genera *Scopulariopsis* Bainier, *Microascus* Zukal and *Doratomyces* Corda. Mycological Papers 86: 1–96.

Samuels GJ. 1988. Fungicolous, lichenicolous, and myxomyceticolous species of *Hypocreopsis, Nectriopsis, Nectria, Peristomalis,* and *Trichnectria.* Memoirs of the New York Botanical Garden 48. 77 p.

Schroers HJ. 2001. A monograph of *Bionectria* (*Ascomycota*, *Hypocreales*, *Bionectriaceae*) and its *Chlonostachys* anamorphs. Studies in Mycology 46. 214 p.

Schroers HJ, Samuels GJ, Gams W. 1999. *Stephanonectria*, a new genus of the *Hypocreales* (*Bionectriaceae*), and its sporodochial anamorph. Sydowia 51(1): 114–126.

Seifert KA, Morgan-Jones GA, Gams W, Kendrick WB. 2011. The genera of hyphomycetes. CBS Biodiversity Series 9. 997 p.

Tode HJ. 1790. Fungi Mecklenburgenses selecti 1. 47 p.

Tulloch M. 1972. The genus *Myrothecium* Tode ex Fr. Mycological Papers 130. 42 p.

Wingfield MJ. 1985. Reclassification of *Verticicladiella* based on conidial development. Transactions of the British Mycological Society 85: 81–93. https://doi.org/10.1016/S0007-1536(85)80157-1